What is claimed is:

1. An isolated nucleic acid molecule encoding an insect odorant receptor.

2. An isolated DNA, cDNA, genomic DNA, synthetic DNA or RNA of claim 1.

3. An isolated nucleic acid molecule of claim 1, wherein the nucleic acid molecule encodes a Drosophila odorant receptor.

4. The isolated nucleic acid molecule of claim 3 which comprise:
   (a) one of the nucleic acid sequences as set forth in Figure 8,
   (b) a sequence being degenerated to a sequence of (a) as a result of the genetic code; or
   (c) a sequence encoding one of the amino acid sequences as set forth in Figure 8.

5. A nucleic acid molecule of at least 12 nucleotides capable of specifically hybridizing with the sequence of a nucleic acid molecule of claim 1.

6. A DNA, cDNA, genomic DNA, synthetic DNA or RNA of claim 5.

7. A vector which comprises the isolated nucleic acid molecule of claim 1, or 5.

8. An isolated nucleic acid molecule of claim 7 operatively linked to a regulatory element.

9. A plasmid of claim 8.

10. A host vector system for the production of a polypeptide having the biological activity of an insect

odorant receptor which comprises the vector of claim 7 and a suitable host.

11. A host vector system of claim 10, wherein the suitable host is a bacterial cell, yeast cell, insect cell, or animal cell.

12. A method of producing a polypeptide having the biological activity of an insect odorant receptor which comprising growing the host vector system of claim 11 under conditions permitting production of the polypeptide and recovering the polypeptide so produced.

13. A purified, insect odorant receptor.

14. A polypeptide encoded by the isolated nucleic acid molecule of claim 1.

15. An antibody capable of specifically binding to an insect odorant receptor.

16. An antibody capable of competitively inhibiting the binding of the antibody of claim 15.

17. A monoclonal antibody of claim 15 or 16.

18. A method for identifying cDNA inserts encoding an insect odorant receptors comprising:

(a) generating a cDNA library which contains clones carrying cDNA inserts from antennal or maxillary palp sensory neurons;

(b) hybridizing nucleic acid molecules of the clones from the cDNA libraries generated in step (a) with probes prepared from the antenna or maxillary palp neurons and probes from heads lacking antenna or maxillary palp neurons or from virgin female body tissue;

(c) selecting clones which hybridized with probes from the antenna or maxillary palp neurons but not from head lacking antenna or maxillary palp neurons or virgin female body tissue; and

(d) isolating clones which carry the hybridized inserts, thereby identifying the inserts encoding odorant receptors.

19. A method of claim 18, after step (c), further comprising:

(a) amplifying the inserts from the selected clones by polymerase chain reaction;

(b) hybridizing the amplified inserts with probes from the antennal or maxillary palp neurons; and

(c) isolating the clones which carry the hybridized inserts, thereby identifying the inserts encoding the odorant receptors.

20. A method of claim 19, wherein the probes are cDNA probes.

21. The cDNA inserts identified by the method of claim 18 or 19.

22. A method for identifying DNA inserts encoding an insect odorant receptors comprising:

(a) generating DNA libraries which contain clones carrying inserts from a sample which contains at least one antennal or maxillary palp neuron;

(b) contacting clones from the cDNA libraries generated in step (a) with nucleic acid molecule of claim 5 in appropriate conditions permitting the hybridization of the nucleic acid molecules of the clones and the nucleic acid molecule;

(c) selecting clones which hybridized with the nucleic acid molecule; and

(d) isolating the clones which carry the hybridized inserts, thereby identifying the inserts encoding the odorant receptors.

23. A method to identify DNA inserts encoding an insect odorant receptors comprising:

(a) generating DNA libraries which contain clones with inserts from a sample which contains at least one antenna or maxillary palp sensory neuron;

(b) contacting the clones from the DNA libraries generated in step (a) with appropriate polymerase chain reaction primers capable of specifically binding to nucleic acid molecules encoding odorant receptors in appropriate conditions permitting the amplification of the hybridized inserts by polymerase chain reaction;

(c) selecting the amplified inserts; and

(d) isolating the amplified inserts, thereby identifying the inserts encoding the odorant receptors.

24. A method to isolate DNA molecules encoding insect odorant receptors comprising:

(a) contacting a biological sample known to contain nucleic acids with appropriate polymerase chain reaction primers capable of specifically binding to nucleic acid molecules encoding insect odorant receptors in appropriate conditions permitting the amplification of the hybridized molecules by polymerase chain reaction;

(b) isolating the amplified molecules, thereby identifying the DNA molecules encoding the insect odorant receptors.

25. A method of transforming cells which comprises transfecting a host cell with a suitable vector of claim 7.

26. Transformed cells produced by the method of claim 25.

27. The transformed cells of claim 26, wherein the host cells are not usually expressing odorant receptors.

28. The transformed cells of claim 26, wherein the host cells are expressing odorant receptors.

29. A method of identifying a compound capable of specifically bind to an insect odorant receptor which comprises contacting a transfected cells or membrane fractions of the transfected cells of claim 26 with an appropriate amount of the compound under conditions permitting binding of the compound to such receptor, detecting the presence of any such compound specifically bound to the receptor, and thereby determining whether the compound specifically binds to the receptor.

30. A method of identifying a compound capable of specifically bind to an insect odorant receptor which comprises contacting an appropriate amount of the purified odorant receptor of claim 13 with an appropriate amount of the compound under conditions permitting binding of the compound to such purified receptor, detecting the presence of any such compound specifically bound to the receptor, and thereby determining whether the compound specifically binds to the receptor.

31. A method of claim 30, wherein the purified receptor is embedded in a lipid bilayer.

32. A method of identifying a compound capable of activating the activity of an insect odorant receptor which comprises contacting the transfected cells or membrane fractions of the transfected cells of claim 26 with the compound under conditions permitting the

activation of a functional odorant receptor response, the activation of the receptor indicating that the compound is capable of activating the activity of a odorant receptor.

33. A method of identifying a compound capable of activating the activity of an odorant receptor which comprises contacting a purified odorant receptor of claim 13 with the compound under conditions permitting the activation of a functional odorant receptor response, the activation of the receptor indicating that the compound is capable of activating the activity of a odorant receptor.

34. A method of claim 33, wherein the purified receptor is embedded in a lipid bilayer.

35. A method of identifying a compound capable of inhibiting the activity of a odorant receptor which comprises contacting the transfected cells or membrane fractions of the transfected cells of claims 26 with an appropriate amount of the compound under conditions permitting the inhibition of a functional odorant receptor response, the inhibition of the receptor response indicating that the compound is capable of inhibiting the activity of a odorant receptor.

36. A method of identifying a compound capable of inhibiting the activity of a odorant receptor which comprises contacting an appropriate amount of the purified odorant receptor of claim 13 with an appropriated amount of the compound under conditions permitting the inhibition of a functional odorant receptor response, the inhibition of the receptor response indicating that the compound is capable of activating the activity of a odorant receptor.

37. A method of claim 30, wherein the purified receptor is embedded in a lipid bilayer.

38. A method of claim 29, 30, 31, 32, 33, 34, 35, 36, or 37 wherein the compound is not previously known.

39. The compound identified by the method of claim 38.

40. A method of controlling pest populations which comprises identifying odorant ligands by the method of claim 29, 30, 31, 32, 33, 34, 35, 36, or 37 which are alarm odorant ligands and spraying the desired area with the identified odorant ligands.

41. A method of controlling a pest population which comprises identifying odorant ligands by the method of claim 29, 30, 31, 32, 33, 34, 35, 36, or 37 which interfere with the interaction between the odorant ligands and the odorant receptors which are associated with fertility.

Amended Claims:

40. (Amended) method of controlling a pest population which comprises identifying odorant ligands by the method of claim 29 [,30, 31, 32, 33, 34, 35, 36, or 37] which are alarm odorant ligands and spraying the desired area with the identified odorant ligands.